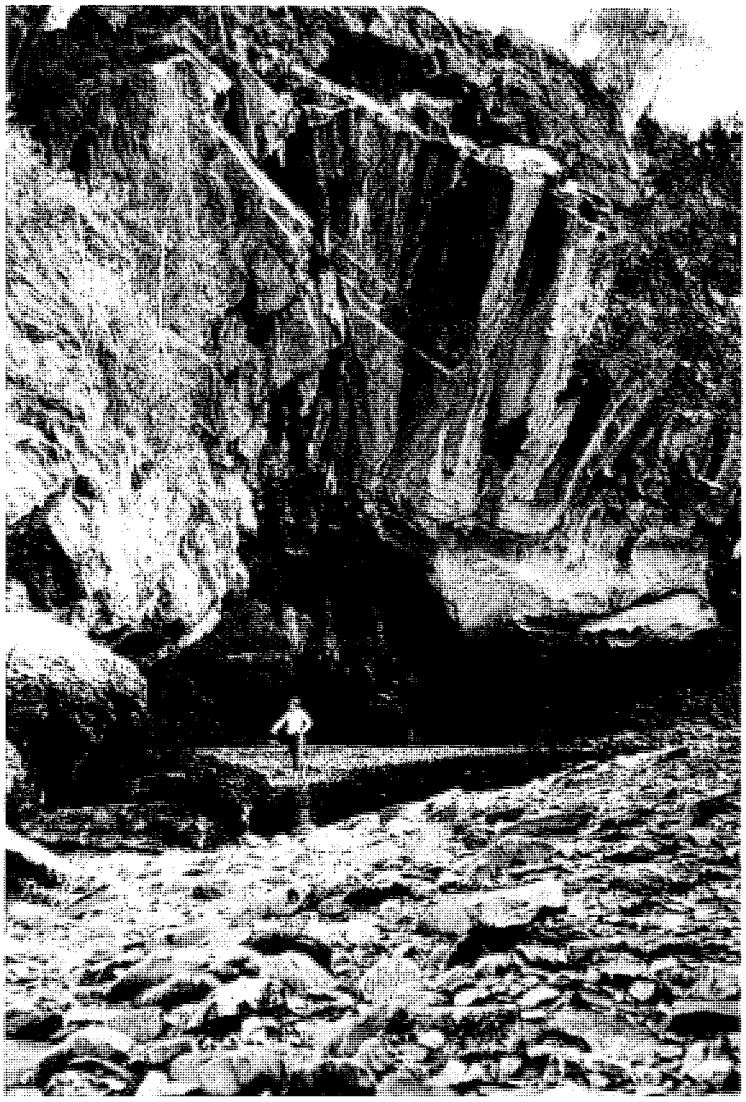
an atlas of

TASMANIAN KARST

Volume 1



by

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That so many tribespeople, farmers, scientists, engineers and land management officials have shared with me some of their dilemmas, their triumphs, their insights and their awe has been a privilege of immense value in its own right and has contributed greatly to developing the perspectives evident in these pages. The greatest inspiration of all has, of course, been those landscapes that have drawn us all together: karstlands from glaciated mountain environments to tropical coastlines, from deserts to rainforests both tropical and temperate, from empty wildlands to some of the most densely populated and impacted terrain, from broad karst plains covered by paddy fields to the stunning vertical rockscapes that are towerkarst. These remarkable landscapes deserve to be regarded with humility and respect: some of Tasmania's karst heritage stands tall among them.

SUMMARY

Part A Karst Systems: A Tasmanian Context

Tasmania's karst areas offer a variety of economic, scientific, educational and recreational resources, and, carefully managed, can continue to do so. The essential characteristics of karst stem from the fact that particular types of rock, commonly limestone or dolomite, have the capacity to be dissolved by natural waters, allowing seepage water and streams to be diverted underground. In the most fully expressed karst, integrated cave systems form the focus of underground drainage networks that are highly efficient. Karst areas offer a variety of heritage values but also pose a range of geomorphic hazards that include soils that are sometimes vulnerable to erosion or sudden collapse, and vulnerable aquifers.

Streams in underground solution channels often flow in directions that cannot be predicted from the surface topography. These streams have the capacity to rapidly transfer localised impacts to the wider karst system and, hence, the aquifers are easily polluted. This can have important implications both for the protection of nature conservation values and for sustainable land management. The need to safeguard hydrological regimes and the soil and vegetation systems that condition water quantity and chemistry must be taken fully into account in developing and implementing management strategies if important heritage values are to be safeguarded and society's exposure to most of the geomorphic hazards that exist in many karst areas is to be minimised. The three-dimensional world beneath our feet is not a separate world. Rather, it is an extension of the surface world, and one highly integrated with the surface world.

Karst environments result from a complex interplay between climatic, topographic, hydrologic, biologic and temporal factors and trends. Hence, a systems approach provides the most adequate means of seeking to come to terms both with the karst environment and with the requirements for determining appropriate uses and sustainable management of karst environments. The focus of this study is upon the maintenance of geodiversity in karst environments. A karst area classification system has been developed to facilitate the identification of sites of geoconservation significance. This involves analysis at four levels: the *Karst Systems* level, or the mix of basic environmental controls that condition the evolution of any karst; the *Karst Landform and Landform Communities* level, or the individual species and communities of landforms that exist in any area; the *Landform Contents* level, which includes the various geological, biological and other phenomena found in caves and sinkholes; and *Human Use and Aesthetics.*

The environmental systems that form the broad parameters within which Tasmania's karst has evolved are addressed in Chapter 2. These systems have largely controlled the nature of the landforms and landform communities that have developed, and the variations within them. In a sense, the system determinants can reasonably be utilised in a manner similar to that in which bio-regions are used to identify the broad environmental contexts from which representative examples of species and communities appropriate for conservation can be identified and selected. The principal difference is that while the karst environmental systems provide the framework from within which examples should be selected, the karst system controls are seldom spatially exclusive; rather, they overlap and interact with one another. Herein lies the origin of Tasmania's karst geodiversity, and the challenge to developing a comprehensive yet workable geoconservation strategy for karst phenomena.

Part B An Atlas of Tasmanian Karst Areas

Chapters 3 to 8 provide a brief overview of the 300 carbonate rock areas recorded in, respectively, the north-west, west, south-west, south-east, and north-east of Tasmania, and on some Bass Strait islands. Each area and its catchment has been depicted on maps at 1:100,000 scale that have been photo-reduced for presentation here but are available at the original scale for digitising to Geographical Information Systems, or for other purposes. The broad systems context of each area is tabulated and a very brief summary of any known karst phenomena is appended. A brief introduction to each chapter provides a regional setting.

Part C Discussion and Conclusions

Chapter 9 provides a brief synthesis of management issues that arise in Tasmania's karst, including the vulnerability of soil and groundwater systems, accelerated sinkhole collapse affecting agricultural land and sometimes roads, refuse dumping in sinkholes, the risk of agricultural chemicals entering groundwater systems, the need for improved streamside management, issues related to limestone quarrying and forestry activities, and the management of caves used for recreational caving and commercial tourism. The inadequacy of managing arbitrarily-defined land parcels that have been superimposed on a highly

interactive and systemic environment, is discussed: there is a need for a trans-tenure perspective on management of such systems. The desirability of developing community-based karstcare programs is addressed, together with the need to upgrade the system of formal reservation to protect some phenomena of major geoheritage significance.

Initial steps towards the development of predictive modelling as an aid to strategic planning are discussed, together with approaches to the management of individual karst areas including the desirability of karst inventory and sensitivity mapping processes. General principles in geoheritage conservation are discussed and a preliminary list of karst landform species recorded to date from Tasmania's karsts is appended. The assessment of conservation status at the systems, landform assemblage, and individual landform species levels are addressed, using examples.